

**Annual Report 2011**

**Production Sector**

OMB Control No. 2060-0328  
Pending OMB Approval



**Company Information**

Company Name: **Noble Energy, Inc. (NEI)**

Gas STAR Contact: **Steven Broadaway**

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Company Information Updated: **Yes**

**Activities Reported**

**BMP1: No BMP2: No BMP3: Yes**

Total Methane Emission Reductions Reported This Year: **253,940**

Previous Years' Activities Reported: **Yes**

**Period Covered by Report**

From: **01/01/2011**

To: **12/31/2011**

☒ I hereby certify the accuracy of the data contained in this report.

**Additional Comments**

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BMP3: Partner Reported Opportunities (PROs)

Current Year Activities

A. Facility/location identifier information:

Wattenberg Operations Area

B. Description of PRO

Please specify the technology or practice that was implemented:

Artificial lift: install smart lift automated systems on gas wells (10 years)

Please describe how your company implemented this PRO:

"Smart" automation system was installed on 534 gas wells in 2011 in the Wattenberg Operations Area. The "Smart" automation system monitors the well's production parameters such as tubing and casing pressures, flow rate, and plunger travel times. These remote telemetry units coupled with company software optimize plunger lift usage, which results in fewer well blowdown events.

C. Level of Implementation

Number of units installed: 534 units

D. Methane Emissions Reduction

Methane Emissions Reduction: 15,828 Mcf/year

Basis for the emissions reduction estimate: Other

Assuming natural gas is an ideal gas and assuming standard conditions, the Ideal Gas Law equation can be applied to calculate the volume of gas vented per well blowdown. The variables used in the ideal gas law calculations are given below:

Tubing

Average initial pressure = 170 psig

Final pressure = 0 psig

Average tubing volume = 152 cubic feet

~1800 cubic feet gas emitted per well blowdown event

Casing

Average initial pressure = 700 psig

Final pressure = 400 psig

Average tubing volume = 415 cubic feet

~8500 cubic feet gas emitted per well blowdown event

Tubing and Casing

$1800 + 8500 = 10300$  scf = 10 mcf gas emitted per well blowdown event

Estimated number of blowdown events/well-year:

Un-automated wells = 4.2\*

Automated wells = 0.2\*\*

Savings due to automation = 4.0

\*\*Assumes 95% reduction in blowdown events after automation, based on field estimates

Savings:

$4 \text{ blowdowns/well-year} \times 10 \text{ mcf gas/blowdown} \times 0.741 \text{ mcf CH}_4/\text{mcf gas} \times 534 \text{ wells} = 15,828 \text{ mcf CH}_4 \text{ saved}$

(Calculations assume gas saved is 74.1% methane by volume)

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**E. Are these emissions reductions a one-year reduction or a multi-year reduction?**

One-year                      ☒ Multi-year

**If Multi-year:**

- ☒ Partner will report this activity once and let EPA automatically calculate future emission reductions based on sunset date duration.

Partner will report this activity annually up to allowed sunset date.

**F. Cost Summary**

Estimated cost of implementing the PRO (including equipment and labor): **\$ 5,340,000**

**G. Total Value of Gas Saved**

Value of Gas Saved: **\$ 47,484**

\$ / Mcf used: **\$ 3.00**

**H. Planned Future Activities**

To what extent do you expect to implement this PRO next year?: **Automation program will continue on all new drills and until all wells are automated.**

**Previous Years' Activities**

<b>Year</b>	<b>Frequency of practice/activity or # of Installations</b>	<b>Total Cost * (\$)</b>	<b>Estimated Reductions (Mcf/Yr)</b>	<b>Value of Gas Saved (\$)</b>
2008	544	6,500,000	18,000	72,000
2009	715	8,600,000	21,000	84,000
2010	3,179	31,790,000	94,226	376,904

\* Total cost of practice/activity (including equipment and labor)

**Additional Comments**

Cost estimates are based on \$10,000 per well, per the Wattenberg automation manager.

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BMP3: Partner Reported Opportunities (PROs)

Current Year Activities

**A. Facility/location identifier information:**

**All Onshore Domestic**

**B. Description of PRO**

Please specify the technology or practice that was implemented:

**DI&M: leak detection using IR camera/optical imaging**

Please describe how your company implemented this PRO:

**A maintenance program was developed using several IR cameras to survey sites at Noble-operated onshore facilities. Once fugitive emissions are identified using IR, they are repaired on site or scheduled for repair.**

**C. Level of Implementation**

**Other:** Leak imaging surveys were completed as part of the maintenance program on approximately 275 sites throughout Noble's onshore domestic facilities. About 471 repairs were made to minimize fugitive emissions from these facilities.

**D. Methane Emissions Reduction**

Methane Emissions Reduction: **38,405 Mcf/year**

Basis for the emissions reduction estimate: **Other**

The Gas STAR Emission Reduction Quantification Reference Guide document was used as the basis for the emission reduction calculation related to the directed inspection and maintenance program. The "Lessons Learned" emission factors for various component types were used along with the following equation:

$$ER = EF \times AF \times XCH_4 \times 70\% \text{ reduction on average through DI\&M}$$

Where,

ER = Emissions Reductions (MCF/year)

EF = Emission Reductions Factors (MCF/year)

AF = Activity Factor (number of components)

XCH<sub>4</sub> = Mole fraction of methane in the gas

Each of the repairs completed due to the directed inspection and maintenance program were categorized based on the leaking component follows: pressure relief valve, connection, flange, or open ended line. The emission factor corresponding to each of these components was used along with the equation listed above to estimate the emission savings obtained from repairing each of the identified leaks.

Additionally, some low bleed devices were found to have install errors or other issues that caused it to emit fugitive gas as a high bleed pneumatic. These devices were discovered and fixed using the IR camera DI&M program. To estimate the emission reduction from the repairs, the emission factor difference between a high bleed and low bleed pneumatic device was used from 40 CFR Part 98 Subpart W, EPA's mandatory GHG reporting rule.

References: [epa.gov/gasstar/documents/xls/quantifying\\_ngo\\_methane\\_reduction.xls](http://epa.gov/gasstar/documents/xls/quantifying_ngo_methane_reduction.xls)

[http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?](http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=4e79deb8c6012ef2277b78ff59b86895&rgn=div6&view=text&node=40:21.0.1.1.3.23&idno=40)

[c=ecfr&sid=4e79deb8c6012ef2277b78ff59b86895&rgn=div6&view=text&node=40:21.0.1.1.3.23&idno=40](http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=4e79deb8c6012ef2277b78ff59b86895&rgn=div6&view=text&node=40:21.0.1.1.3.23&idno=40)

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E. Are these emissions reductions a one-year reduction or a multi-year reduction?

✓ One-year

Multi-year

If Multi-year:

Partner will report this activity once and let EPA automatically calculate future emission reductions based on sunset date duration.

Partner will report this activity annually up to allowed sunset date.

F. Cost Summary

Estimated cost of implementing the PRO (including equipment and labor): \$ 100,000

G. Total Value of Gas Saved

Value of Gas Saved: \$ 115,215

\$ / Mcf used: \$ 3.00

H. Planned Future Activities

To what extent do you expect to implement this PRO next year?: Due to the burden of complying with the new greenhouse gas reporting rule, continual support of the PRO is needed. However, we expect to still continue with the program as much as possible, and expand it in the future.

Previous Years' Activities

Year	Frequency of practice/activity or # of Installations	Total Cost * (\$)	Estimated Reduction (Mcf/yr.)	Value of Gas Saved (\$)
2010	837	200,000	22,700	90,800
2009	480	160,000	10,000	52,000

\* Total cost of practice/activity (including equipment and labor)

Additional Comments

No additional cameras were purchased in 2011, so the cost summary includes labor, vehicle costs, airfare, and various travel costs to onshore facilities.

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BMP3: Partner Reported Opportunities (PROs)

Current Year Activities

**A. Facility/location identifier information:**

**Wattenberg Operations Area**

**B. Description of PRO**

Please specify the technology or practice that was implemented:

**Install vapor recovery units (VRUs) on storage tanks (10 years)**

Please describe how your company implemented this PRO:

**VRUs have been installed and in use during 2011 in the Wattenberg Operations Area to capture flash gas. Some of the VRUs have been Noble owned for several years and others are leased.**

**C. Level of Implementation**

**Number of units installed: 75 units**

**D. Methane Emissions Reduction**

Methane Emissions Reduction: **199,707 Mcf/year**

Basis for the emissions reduction estimate: **Other**

There are 67 VRUs that capture 32 mcf of flash gas/day, 3 that capture 130 mcf/day, and 5 that capture 20 mcf/day.

Using a flash gas methane percentage of 31.3% for the Wattenberg area, that's 289,497 mcf CH<sub>4</sub>/yr.

This number is offset by the field gas consumed by the VRU compressors.

68 compressors use 3 mcf/day of field gas and 6 of them use 7 mcf/day

**E. Are these emissions reductions a one-year reduction or a multi-year reduction?**

One-year                      ☒ Multi-year

**If Multi-year:**

- ☒ Partner will report this activity once and let EPA automatically calculate future emission reductions based on sunset date duration.

Partner will report this activity annually up to allowed sunset date.

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**F. Cost Summary**

Estimated cost of implementing the PRO (including equipment and labor): **\$ 2,800,000**

**G. Total Value of Gas Saved**

Value of Gas Saved: **\$ 599,121**

\$ / Mcf used: **\$ 3.00**

**H. Planned Future Activities**

To what extent do you expect to implement this PRO next year?: **VRUs will continue to operate as long as conditions allow.**

**Previous Years' Activities**

<b>Year</b>	<b>Frequency of practice/activity or # of Installations</b>	<b>Total Cost * (\$)</b>	<b>Estimated Reductions (Mcf/Yr)</b>	<b>Value of Gas Saved (\$)</b>

\* Total cost of practice/activity (including equipment and labor)

**Additional Comments**

Estimated cost summary includes purchase price of Noble owned units, annual maintenance costs, and annual leasing costs of leased units.

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### Additional Accomplishments

NEI plans to expand its IR camera maintenance program in the Wattenberg Operations Area. Two additional dedicated IR camera operators will be employed to survey sites and repair any issues.